

REMARKS

An Office Action was mailed on July 7, 2004. Claims 1 – 18 are currently pending in the application.

REJECTION UNDER 35 U.S.C. § 103

Claims 1, 2, 7 – 10, 13 and 16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over “Image Precision Silhouette Edges” (to Raskar et al.) in view of “Computer Graphics: Principles and Practices (to Foley). Claims 3, 11, 14 and 17 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Raskar in view of Foley and “Stylized Rendering Techniques For Scalable Real-Time 3D Animation (to Lake et al.). Claims 4 - 6, 12, 15 and 18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Raskar in view of Foley, Lake and U.S. Patent No. 6,361,438 to Morihira. Applicants respectfully traverse these rejections.

In a Response to the final Office Action of January 15, 2004, Applicants presented the following arguments:

Raskar discloses a method for generating silhouette edges of a polygon (see, e.g., page 136, section 3., page 137, sections 3.2, 3.3 of Raskar). In the method of Raskar, a back-visible surface is projected in a direction N_B normal to the back visible surface (see Figure 2 of Raskar). Edges of the projected surface are then extended and rendered in black in order to create a silhouette (see Figure 4 of Raskar).

Lake is introduced for teaching reducing the width of a silhouette with increasing distance of a surface from a viewpoint. Morihira is introduced as teaching diminished color variation of the silhouette from front-facing surfaces with increasing distance of a surface from a viewpoint.

In independent claims 1 and 7 – 9, Applicants disclose a system, method, storage medium and computer program for executing the processes of: a) judging a direction of a polygon constituting a three dimensional model, in relation to a viewpoint, and b) shifting vertices of a first polygon that face a back side in

relation to the viewpoint, in a direction of a normal, generating a second polygon by connecting said vertices thus shifted, and painting said second polygon with a color that is darker than a color of said first polygon.

Notably, Applicants disclosed method generates its second polygon by shifting vertices of one or more back facing sides of the first polygon in three dimensional space. Each vertex is shifted in a normal direction, determined as an average of normals for each of a plurality of surfaces of the first polygon that abuts the vertex (see, e.g., page 7, lines 27, 28 of Applicants' invention). The second polygon is then generated by interconnecting these shifted vertices.

Applicants' approach lies in sharp contrast to the approach disclosed by Raskar, in which each backward facing polygon surface is shifted in a normal direction as defined for the surface. By instead shifting each polygon vertex in a normal direction determined as the average of normals for each surface abutting the vertex, Applicants' approach eliminates a need for the second step disclosed by Raskar that extends edges of the shifted surface shifted in the normal direction in order to create a silhouette. By shifting the vertices in the manner claimed by Applicants, extended and shifted surfaces of the second polygon are effectively and more efficiently produced in a single step. Neither Lake nor Morihira disclose or otherwise suggest Applicants' claimed approach.

The Examiner acknowledges that Raskar fails to disclose Applicants' claim limitation requiring that "the normal for each of the vertices of the first polygon is determined as an average of normals for each of a plurality of surfaces of the first polygon that abuts the vertex", and suggests that this limitation is disclosed by Foley (see, e.g., page 736, paragraph 3 through page 737, paragraph 3 and FIG. 16.18 of Foley).

Foley teaches Gouraud shading as a method for performing intensity interpolation of polygon surfaces. According to this method, polygon surface normals are averaged in order to obtain vertex normals. The polygon is then shaded by linear interpolation of vertex intensities along each edge defined by the vertex normals, and then between edges.

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. MPEP § 2143.01 "The test for

an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

MPEP 2143 provides the following guidelines for establishing prima facie obviousness:

To reach a proper determination under 35 U.S.C. 103, the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicants' disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

Applicants respectfully submit that one skilled in the art would have lacked sufficient motivation at the time of Applicants' invention to combine the teachings of Raskar and Foley in such a manner as to suggest the claimed invention.

Raskar is directed to teaching a method for rendering silhouette edges to a polygon, while Foley is directed to teaching methods for shading surfaces of a polygon. Foley discloses Gouraud shading in its conventional application as a method for shading surfaces of a polygon, and provides no suggestion that the method might alternatively be useful in generating polygon silhouettes. On the other hand, Raskar provides no suggestion that methods of polygon surface shading might be relevant to the task of rendering silhouette edges.

Applicants like Foley disclose Gouraud shading in its conventional application as a method for shading surfaces of a polygon (see, e.g., page 7, lines 24 – 27 of Applicants' specification). However, Applicants further suggest that the computed vertex normals for a back side of the polygon can in addition be used to construct silhouette contours for the polygon (see, e.g. page 8, line 16 through page 9, line 9 of Applicants' specification). Assuming vertex normals are constructed for the shading the polygon surfaces, Applicants' claimed method for producing silhouetting provides a substantial computational savings. As neither Raskar nor Foley teach or suggest additionally using vertex normals for the claimed purpose (i.e., shifting the vertices to create a second polygon that effectively extends the first polygon), Applicants respectfully submit that combining Raskar and Foley to produce this result constitutes impermissible hindsight.

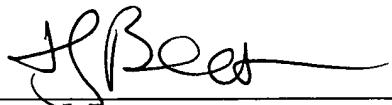
Accordingly, Applicants respectfully submit that independent claims 1 and 7 – 9 are not made obvious by the combination of Raskar, Foley, Lake and Morihira, and are therefore allowable. As claims 2 - 6 and 10 – 18 depend from allowable claims 1 and 7 - 9, Applicants further submit that claims 2 - 6 and 10 – 18 are also allowable for at least this reason.

CONCLUSION

An earnest effort has been made to be fully responsive to the Examiner's objections. In view of the above amendments and remarks, it is believed that claims 1 – 18, consisting of independent claims independent claims 1 and 7 - 9, and the claims depending therefrom, are in condition for allowance. Passage of this case to allowance is earnestly solicited. However, if for any reason the Examiner should consider this application not to be in condition for allowance, he is respectfully requested to telephone the undersigned attorney at the number listed below prior to issuing a further Action.

Any fee due with this paper may be charged on Deposit Account 50-1290.

Respectfully submitted,



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